APPENDIX R-2

VIBRATION AND OVERPRESSURE SOUND ASSESSMENT

BLASTING VIBRATION AND OVERPRESSURE SOUND ASSESSMENT REPORT

Submitted by:

AMEC Environment & Infrastructure,
a Division of AMEC Americas Limited
160 Traders Blvd., Suite 110
Mississauga, Ontario
L4Z 3K7

On behalf of:

Rainy River Resources Limited
1111 Victoria Avenue East
Thunder Bay, Ontario
P7C 1B7

June 2013
TC111504

EXECUTIVE SUMMARY

The Rainy River Gold Project (RRGP) is a gold exploration project situated in the Township of Chapple, approximately sixty-five kilometres (by road) northwest of Fort Frances in northwestern Ontario. The RRGP site and surrounding lands are dominantly privately held, with Rainy River Resources Ltd. (RRR) holding a considerable private land package. RRR has been exploring the RRGP property since 2005, with the objective of constructing, operating and eventually reclaiming a new open pit and underground gold mine and milling complex on the site. RRR is pursuing environmental approvals for the development of open pit and underground gold mine at this location. AMEC Environment & Infrastructure, a division of AMEC Americas Limited, was retained by RRR to prepare an Acoustic Assessment Report for the RRGP site.

RRR is required to complete a Standard Environmental Assessment pursuant to the *Canadian Environmental Assessment Act, 2012* and has volunteered to complete an Individual Environmental Assessment pursuant to the Ontario *Environmental Assessment Act*. This Blasting Vibration and Overpressure Sound Assessment Report has been completed as a supplement to a Federal and Provincial environmental assessment.

The extraction of material from the working face of the open pit mine requires the use of explosives. This generates the potential concern of ground-borne vibration and overpressure sound levels at the points of reception. Vibration and overpressure sound assessment for the RRGP site is based on theoretical (predictive) methods; not on site measurements as the facility is currently in design.

A total of 18 representative worst-impacted points of reception (i.e., the first row of receptors in each cardinal direction) were included in this blasting vibration and overpressure sound assessment. The points of reception considered in the assessment include one house to the north of the RRGP site, seven houses to the east, seven houses to the south and three houses to west.

The vibration and overpressure sound levels from RRGP blasting are predicted using the Ministry of Environment Blasting Noise and Vibration Prediction Model NPC-119. Using charge size per delay and the separation distance between the blast location and assessment receptor, the absolute ground-borne vibration and overpressure sound levels expected at the points of receptions are determined. The predictions are based on generic environmental and topographical conditions, and no adjustments are made to suit site specific conditions.

For the purpose of this assessment, the entire pit area is considered as the blasting location. The distance from the outer perimeter of the open pit to the receptor is considered as the distance to the receptor in the assessment. Since the blasting design is in the preliminary stage, a maximum charge size of 1,000 kg per delay is used for this assessment. This approach was considered to be a conservative approach for assessing vibration and overpressure sound levels from blasting operations. Even with a maximum charge per delay of approximately double

this amount, it is fully expected that compliance would be achieved with the Ministry of Environment cautionary limits for ground-borne vibration and for overpressure sound levels.

Operational noise from mining operation and ore processing were assessed separately provided under a separate cover.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

The Rainy River Gold Project (RRGP) is a gold exploration project situated in the Township of Chapple located primarily on privately held lands, approximately sixty-five kilometres (by road) northwest of Fort Frances in northwestern Ontario. Rainy River Resources Ltd. (RRR) has been exploring the RRGP property since 2005, with the objective of constructing, operating and eventually reclaiming a new open pit and underground gold mine and milling complex on the site. RRR is pursuing environmental approvals for the development of open pit and underground gold mine. AMEC Environment & Infrastructure, a division of AMEC Americas Limited (AMEC), was retained by RRR to prepare a Blasting Vibration and Overpressure Sound Assessment Report for the RRGP site.

RRR is required to complete a Standard Environmental Assessment pursuant to the *Canadian Environmental Assessment Act, 2012* and has volunteered to complete an Individual Environmental Assessment pursuant to the Ontario *Environmental Assessment Act*. This Blasting Vibration and Overpressure Sound Assessment Report has been completed as a supplement to a Federal and Provincial environmental assessment.

The extraction of material from the working face of the open pit mine requires the use of explosives. This generates the potential concern of ground-borne vibration and overpressure levels at the points of reception. Vibration and overpressure sound assessment for the RRGP site is based on theoretical (predictive) methods; not on site measurements as the facility is in design.

2.0 DESCRIPTION OF THE PROPOSED UNDERTAKING

The proposed RRGP site include an open pit, underground mine and a process plant. Open pit mining operations will occur at a rate of approximately 21,000 tonnes per day (tpd) of ore, supported by a planned 1,000 tpd underground mining operation. For contingency purposes, a nominal 20% additional ore throughput should be considered above the planned output. Overburden and mine rock stripped from the open pit will be stored in adjacent stockpiles. Ore will be processed in an onsite ore process plant. The site is expected to operate 24 hours per day and 7 days per week.

An estimated 115 million tonnes of ore will be mined from the open pit and processed at the RRGP during operations. The open pit mine will operate on the basis of two, 12-hour shifts, 365 days per year. Rock will be broken at the face using explosives and will be loaded by using a hydraulic shovel onto 225 tonne (t) off-highway haul trucks, for transport to the primary crusher or stockpiles (ore or mine rock). Approximately 0.32 kilograms (kg) of explosives will be consumed for each tonne of ore or mine rock mined. Annual explosive consumption will range from 10,000 to 19,000 t.

The location of the open pit along with the points of reception is shown in Figure 1. The RRGP blasting design is in the preliminary stage and the charge size per delay is not available during

completion of this assessment. Therefore, a maximum charge size of 1,000 kg is used for this assessment, and has been qualified by RRGP design team as an acceptable maximum charge for their operations.

3.0 POINT OF RECEPTION SUMMARY

Sound sensitive receptors of interest under Ministry of the Environment (MOE) guidelines include the following sound sensitive land uses:

- Permanent, seasonal, or rental residences;
- Hotels, motels and campgrounds;
- Schools, universities, libraries and daycare centres;
- Hospitals and clinics, nursing / retirement homes; and
- Churches and places of worship.

A total of 18 representative worst-impacted points of reception (POR; the first row of receptors in each cardinal direction) were included in this assessment. The PORs considered include one house to the north of the RRGP site, seven houses to the east, seven houses to the south and three houses to west. The PORs considered in the assessment are shown in Figure 1.

4.0 APPLICABLE GUIDELINES

The ground-borne vibration and overpressure sound levels from the RRGP blasting operations are assessed per the MOE NPC-119 Guideline (MOE 1985). There are two sets of criteria provided in NPC-119: cautionary limits and standard limits. The cautionary limits are used in the assessment where no vibration and/or overpressure sound monitoring is expected; and the standard limits are used where regular monitoring is expected during blasting operations. The blasting vibration and overpressure sound level assessment for the RRGP site is completed using the MOE cautionary limits of 10 millimetres per second (mm/sec) for ground-borne vibration and 120 liner decibels (dBL) for overpressure sound levels as ground-borne vibration and overpressure sound level monitoring are not expected at the RRGP site.

5.0 IMPACT ASSESSMENT

The blasting vibration and overpressure sound level assessment for the RRGP site is based on theoretical (predictive) methods; not on site measurements as the facility is in design.

Vibration and overpressure levels from RRGP blasting are predicted using the MOE Blasting Noise and Vibration Prediction Model NPC-119 ("Guidelines on Information Required for Assessment of Blasting Noise and Vibration"; MOE 1985). Using charge size per delay (i.e., explosive used in kg) and the separation distance between the blast location and assessment receptor, the absolute ground-borne vibration and overpressure sound levels expected at the

PORs are determined. The predictions are based on generic environmental and topographical conditions and no adjustments have been made to suite site specific conditions.

For the purpose of this assessment, the entire pit area is considered as the blasting location the distance from the outer perimeter of the open pit to the receptor is considered as the distance to the receptor in the assessment. Since the blasting design is in the preliminary stage a maximum charge size of 1,000 kg is used for this assessment, and has been qualified by RRGP design team as an acceptable maximum charge for their operations. This approach was considered to be conservative for assessing vibration and overpressure sound from blasting operations.

The equation for the overpressure sound is governed by two conditions:

- In front of the working face (i.e., no screening); and
- Behind the working face (with screening).

In either case, additional screening beyond the working face is not accounted for in the base equation. There are no such conditions for ground-borne vibration. The vibration predictions are based on generic environmental and topographical conditions and no adjustments are made to suite site specific conditions.

Predicted ground-borne vibration and overpressure sound levels for the maximum charge size per delay used at the RRGP site are summarized in Table 1. The predicted vibration and overpressure sound levels are not expected to exceed the MOE NPC-119 cautionary limits of 10 mm/sec for ground-borne vibration and 120 dBL for overpressure, respectfully. Even with a maximum charge per delay of approximately double the amount considered in this assessment, it is fully expected that compliance would be achieved with the MOE cautionary limits. Therefore, the RRGP is expected to be in compliance with the applicable MOE guideline. The vibration and overpressure sound level setback contours for the maximum charge size to meet the guideline limits are presented in Figure 2.

6.0 CONCLUSIONS

A blasting vibration and overpressure sound level assessment has been completed for the proposed RRGP operations. As currently configured, the predicted vibration and overpressure sound levels from blasting are not expected to exceed the MOE NPC-119 cautionary limits for the maximum charge size.

It is fully expected that the predicted vibration and overpressure sound levels meet the MOE cautionary limits even with a maximum charge size per delay of approximately double the amount considered in this assessment and a regular sound and vibration monitoring would not be required. Therefore, the RRGP site will be in compliance with the applicable MOE NPC-119 guidelines for its proposed operations. No additional mitigation is required for its proposed operation.

7.0 REFERENCES

Ministry of the Environment. 1982. Noise and Vibration Limits for Blasting, Publication NPC-119.

Ministry of the Environment. 1985. Guidelines on Information Required for Assessment of Blasting Noise and Vibration.

8.0 CLOSING

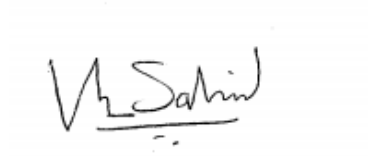
This blasting vibration and overpressure sound assessment report was prepared by AMEC for the sole benefit of of RRR for specific application to the RRGP by AMEC. The quality of information, conclusions and estimates contained herein are consistent with the level of effort involved in AMEC's services and based on: i) information available at the time of preparation, ii) data supplied by outside sources and iii) the assumptions, conditions and qualifications set forth in this document. This report is intended to be used by RRR only, and its nominated representatives, subject to the terms and conditions of its contract with AMEC. Any other use of, or reliance on, this report by any third party is at that party's sole risk. This report has been prepared in accordance with generally accepted industry-standard. No other warranty, expressed or implied, is made.

If you require further information regarding the above or the project in general, please contact the undersigned at (905) 568-2929.

Thank you for the opportunity to be of service to Rainy River Resources Ltd.

Yours truly,
AMEC Environment & Infrastructure
a Division of AMEC Americas Limited

Prepared by:



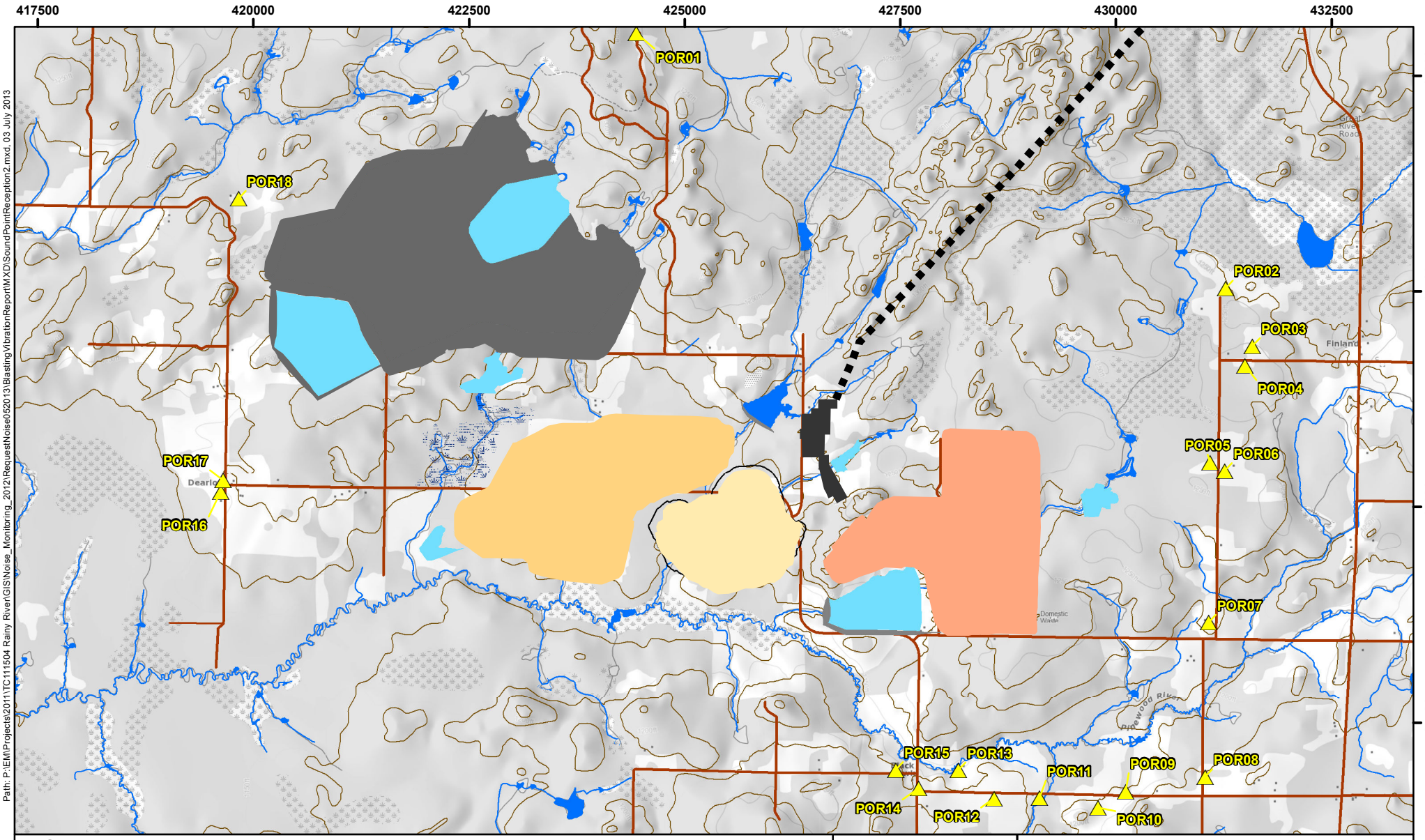
Mohammed Salim, P. Eng.
Senior Acoustics Specialist

Reviewed by:

Frank Babic, P. Eng INCE
Acoustics Practice Lead – Eastern Canada

Table 1: Predicted Vibration and Overpressure Level Summary (Blasting)

POR ID	POR Description	Distance (m)	Charge Size (W) (kg)	Ground-borne Vibration in Peak Particle Velocity (mm/sec)	Overpressure - Peak Sound Pressure Level	
					Infront of Working Face (dBL)	Behind Working Face (dBL)
POR 01	House 01 - North	5213	1000	0.3	112	113
POR 02	House 02 - East	5680	1000	0.3	111	113
POR 03	House 03 - East	5744	1000	0.3	111	113
POR 04	House 04 - East	5486	1000	0.3	111	113
POR 05	House 05 - East	4816	1000	0.4	112	114
POR 06	House 06 - East	4974	1000	0.4	112	113
POR 07	House 07 -Southeast	4875	1000	0.4	112	114
POR 08	House 08 - South	5390	1000	0.3	111	113
POR 09	House 09 - South	4709	1000	0.4	113	114
POR 10	House 10 - South	4549	1000	0.4	113	114
POR 11	House 11 - South	3956	1000	0.5	114	114
POR 12	House 12 - South	3592	1000	0.6	115	115
POR 13	House 13 - South	3057	1000	0.8	116	116
POR 14	House 14 - South	2921	1000	0.8	117	116
POR 15	House 15 - South	2609	1000	1.0	118	116
POR 16	House 16 - West	5053	1000	0.4	112	113
POR 17	House 17 - West	5051	1000	0.4	112	113
POR 18	House 18 - Northwest	6095	1000	0.3	110	113



LEGEND

- Receptor (labelled with ID)
- Existing Roads
- Contours, 10 m interval

Proposed Site Features

- Open Pit
- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

NOTES:
-

Datum: NAD83
Projection: UTM Zone 15N

0 1 2 4 6 8 Kilometres

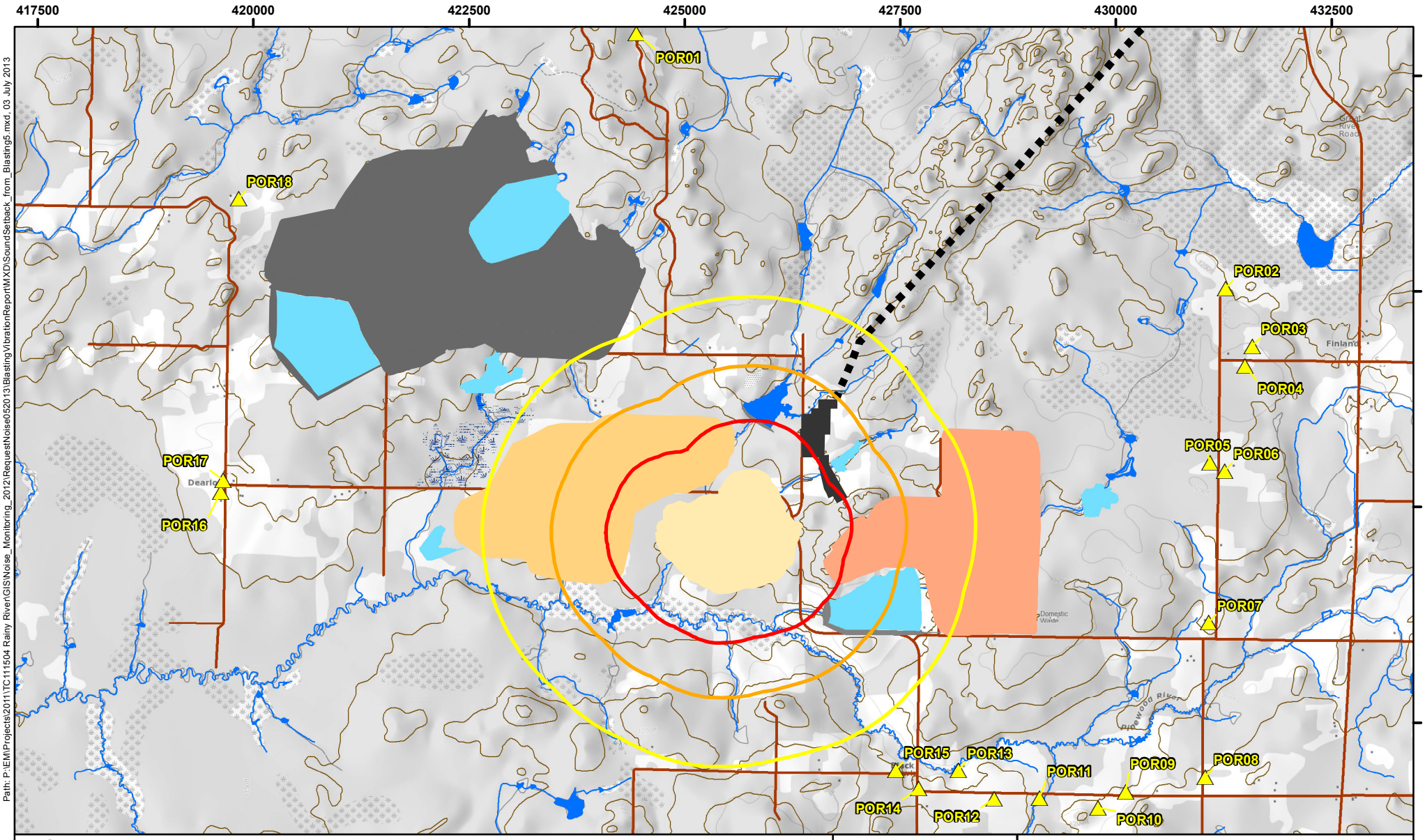
RAINY RIVER

amec

RAINY RIVER GOLD PROJECT

Points of Reception Location

PROJECT N°: TC111504	**FIGURE: 1**
SCALE: 1:61,100	DATE: June 2013



LEGEND

- Receptor (labelled with ID)
- Existing Roads
- Contours, 10 m interval

Proposed Site Features

- Open Pit
- Tailings Management Area
- Overburden / West Mine Rock Stockpile
- Ore / East Mine Rock Stockpile
- Plant Site / Ancillary Facilities
- Ponds
- Transmission Line

Setback Vibration and Overpressure Contours for Blasting

- Ground borne vibration setback contour to meet the criteria limit (i.e., 10 mm/s at 565 m away from the pit perimeter)
- Overpressure setback contour to meet the criteria limit - behind the working face (i.e., 120 dBL at 1,200 m away from the pit perimeter),
- Overpressure setback contour to meet the criteria limit – infront of the working face (i.e., 120 dBL at 2,000 m away from the pit perimeter)

NOTES:
-

Datum: NAD83
Projection: UTM Zone 15N

0 1 2 4 6 8 Kilometres

RAINY RIVER

amec

RAINY RIVER GOLD PROJECT

Setback Vibration and Overpressure Contours for Blasting

PROJECT N°: TC111504	**FIGURE: 2**
SCALE: 1:61,100	DATE: June 2013